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THE BLOW FLIES OF THE GALÁPAGOS ISLANDS (DIPTERA: CALLIPHORIDAE)*

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The blow fly fauna of the Galápagos Islands, like that of Hawaii, consists of an interesting endemic element plus a commonplace introduced one. The latter, so far as known, consists of but a single species, the widespread secondary screw worm, *Cochliomyia macellaria* (Fabricius). Three known species, one of which is herein described as new, comprise the endemic element. Though all of luciliine stock, these endemic species are more heterogenous than the Hawaiian complex and may represent more than one introduction into the archipelago. My decision to refer them to the genus *Phaenicia* was made only after considerable deliberation and partly on the basis of quantitative studies, the results of which will be published elsewhere. According to the Townsend system of restricted genera, three monotypic genera would have to be recognized. I believe, however, that this is not in the interest of sound systematics. The species herein described as new can be referred to *Viridinsula*, as a subgenus, but only by some extension of the present concept of that taxon; in some respects it shows significant structural similarities to the Alaskan *Francilia* and the Hawaiian *Dyscritomyia* and may represent an offshoot of the stem that gave rise to the Hawaiian fauna, possibly through a *Francilia*-like ancestor.

This study was based on material taken on the Galápagos International Scientific Project of 1964 and on a much older collection housed in the United States National Museum; the latter is identified by the designation "USNM." Quantitative studies which aided in the formation of judgment values were done by Jon Shepard as part of a broader project financed by National Science Foundation grant no. B-1440.

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Subfamily Chrysomyinae

Cochliomyia macellaria (Fabricius).

Musca macellaria Fabricius, 1775, p. 776.
Musca phauda Walker, 1849, p. 896.
Lucilia quadrisignata Thomson, 1869, p. 544.

This species was first recorded from the Galápagos Islands by Walker (1849) on the basis of a male collected by Charles Darwin, and later by Thomson (1869), also on the basis of a male; neither author designated the island from which the respective types came. Coquillett (1901) recorded the species, as *Chrysomyia quadrisignata* (Thomson), from Albemarle (Isabela) and Charles (Santa María) islands, and Johnson (1924) gave the proper synonymy and recorded it from Indefatigable (Santa Cruz) Island. Curran (1932, 1934), in addition to recording it again from Charles Island, added Barrington (Santa Fé), Hood (Española), and Chatham (San Cristóbal) islands.

The California Academy of Sciences material contains a long series (more than a hundred) of males and females from the Darwin Research Laboratory, Academy Bay, Santa Cruz Island, January 26, 1964, R. O. Schuster; 1 ♀, Bella Vista Trail, Santa Cruz Island, February 11, 1964, D. Q. Cavagnaro; 4 ♂ ♂, Grassland, 750 meters, Santa Cruz Island, April 6, 1964, D. Q. Cavagnaro; and 1 ♀, upper Caldera areas, Pinzón Island, February 7, 1964, D. Q. Cavagnaro.

Subfamily Calliphorinae

Shannon (1926) proposed the name *Viridinsula* as a subgenus of *Lucilia*, with *Musca pionia* Walker as the type and sole included species. Curran (1934) accepted this taxon as a genus, but Aubertin (1934) did not give it even subgeneric status. As a geographical segregate that has deviated in significant ways from the supposed parental stock, it deserves recognition as a taxonomic entity, but because of difficulties in defining it clearly, the subgeneric designation is preferable to the generic.

The following key will separate the Galápagos Islands species of *Phaenicia* and, incidentally, the known species of *Viridinsula*.

1. Head distinctly extended downward and forward (fig. 1); body shining, mesonotum and abdomen bright metallic green to coppery, the pollen evident only under magnification ..... *P. (V.) pionia*
   Head extended forward but not strongly downward (fig. 6); mesonotum and abdomen distinctly dulled by pale pollen, clearly visible even without magnification 2
2. Mesonotum and abdomen bright shining green, overlaid extensively by a dense whitish pollen; frons of male about one-sixth head width; hindmost preintraalar at least almost as well developed as the other two ..... *P. (V.) setosa*
   Mesonotum and abdomen dull blackish or greenish black, with a moderately dense whitish pollen; frons of male one-fifth to one-fourth head width; hindmost preintraalar very weak or absent ..... *P. (V.) deceptor*

Phaenicia (Viridinsula) pionia (Walker), new combination.

Musca pionia WALKER, 1849, p. 880.

Lucilia (Viridinsula) pionia (Walker), SHANNON, 1926, p. 131.

This species was described from a male collected by Charles Darwin. Aubertin (1934) briefly redescribed the type and illustrated a lateral view of the head; she remarked that at that time the abdomen was missing. The type, when I examined it in September, 1964, was still in good condition except for the missing abdomen and middle and hind legs on one side. There is no indication either on the label or in the description as to which island the type came from. Curran (1932) recorded the species from Floreana (Santa María) Island; later (1934) he stated that the preceding record was based on a misidentification, but gave as new records Charles (Santa María) and Indefatigable (Santa Cruz) islands.

The following head measurements of the type are in micrometer units (60 = 1 mm.): head width, 148; frons at narrowest, 20; frontal stripe at narrowest, 10; width of vertex, 26; eye height, 100; head height, 136; parafacial at narrowest, 14, at lunule, 18, at anterior tentorial pit, 20; distance between vibrissae, 28; vibrissa to oral margin, 8, to nearest part of eye, 40. Length third antennal segment, 46; apex third antennal segment to vibrissa, 3. The frontal stripe is parallel-sided for most of its length but widens a little at the lunule. The antenna is longer and more closely approaches the vibrissal level than Aubertin's drawing would indicate; otherwise that illustration seems quite accurate. The palpi are yellow, as Aubertin describes them, contrary to the statement of Walker that they are black.

The male genitalia illustrated in figures 2 and 3 are drawn from the Tower Island specimen. This male corresponds well with Walker's description, with allowance for correction in the color of the palpi, and the measurements, both actually and relatively, are essentially those of the type, except that the vibrissae are a little farther apart (35 micrometer units).

The color of the abdomen and to a lesser extent the thorax varies. The mesonotum of the Santa Cruz Island male is largely coppery; the females show indications of a black presutural vitta between each acrostichal and dorsocentral row; the second and third terga are distinctly margined with black in both sexes. The frons of the female at its narrowest is a little less than one-third the head width; comparative measurements of the head width and frons for three females, in micrometer units, are 168, 52; 138, 43; and 140, 45.

I have examined, in addition to the type, the female recorded by Curran from Indefatigable (Santa Cruz) Island; also 1 ♂, Santa Cruz Island, Horneman Farm, 220 meters, March 25, 1964, D. Q. Cavagnaro; also 1 ♂, 2 ♀ ♀, Genovesa (Tower) Island, June 23, 1899 (USNM).

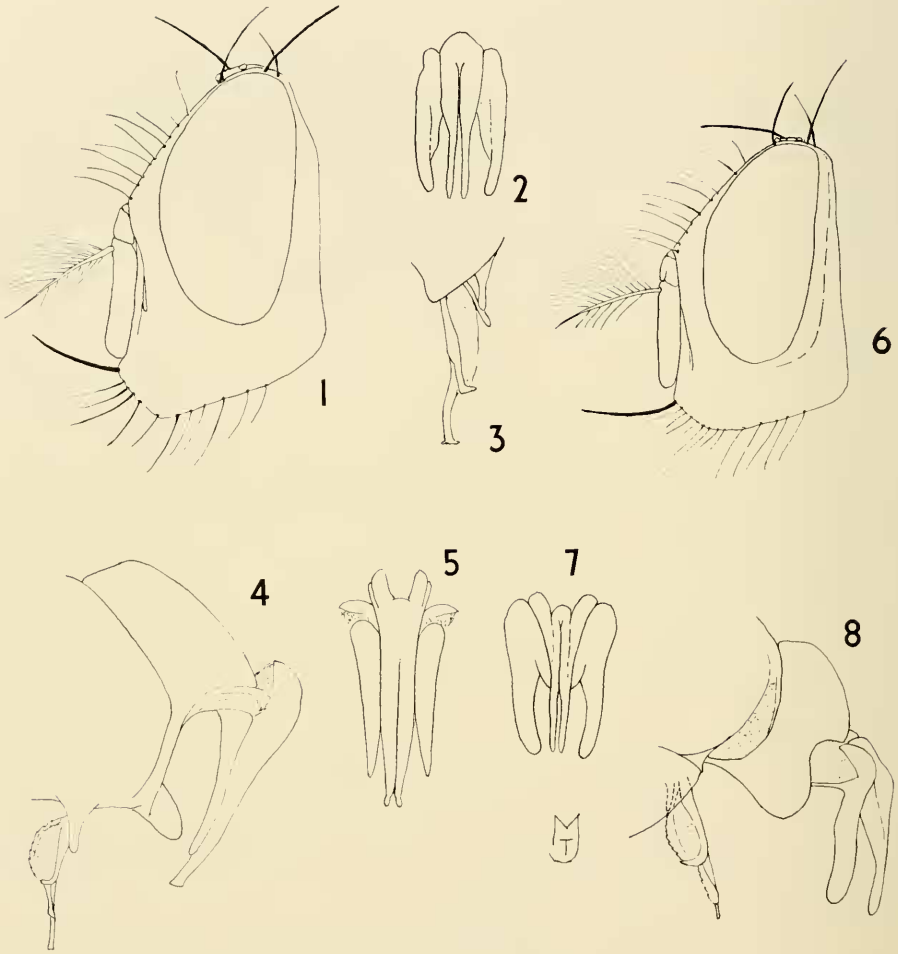

FIGURE 1. *Phaenicia pionia* (Walker), head, side view.
FIGURE 2. Same, male forceps, dorsal view.
FIGURE 3. Same, aedeagus.
FIGURE 4. *Phaenicia deceptor* (Curran), male genitalia, side view.
FIGURE 5. Same, male forceps, dorsal view.
FIGURE 6. *Phaenicia setosa*, new species, head, side view.
FIGURE 7. Same, male forceps, dorsal view.
FIGURE 8. Same, male genitalia, side view.

All setulae and bristles, except those around the periphery of the head, are omitted for purposes of simplification.

Phaenicia (Viridinsula) deceptor (Curran), new combination.

Viridinsula deceptor Curran, 1934, p. 166.

Curran's description is, for the most part, adequate. The pile of the parafrontals, particularly on the upper part, is much more conspicuous than in the other two species of *Viridinsula*. The hindmost preintraalar may be feebly developed; Curran says that it is absent. Some variation exists in the width of the male frons; it is wider in the Hood (Española) than in the Narborough (Fernandina) Island specimens, but this does not seem to justify even subspecific separation, since there appear to be no other significant differences. Comparative ratios are 0.21 for the Narborough male, 0.24 to 0.25 for the Hood (Española) males, and 0.24 for the holotype, from North Seymour (Baltra) Island.

The male genitalia (figs. 4, 5) are distinctive, and the fifth sternite is deeply incised and drawn out into elongated, hairy and bristly lobes, quite unlike the broad triangular plates of the other two species.

Curran's type series came from North Seymour (Baltra) (holotype), Albemarle (Isabela), Hood (Española), and Floreana (Santa María) islands. He also obtained it from Cocos Island which is not in the Galápagos group. I have examined 1 ♀, 2 ♂♂, Española Island, Punta Suarez, February 2, 1964, E. G. Linsley; 7 ♂♂, 1 ♀, Hood (Española) Island, May 18, 1899 (USNM); 2 ♀♀, Albemarle (Isabela) Island, January 16, 1899 (USNM); and 3 ♂♂, 3 ♀♀, Narborough (Fernandina) Island, January 13, 1899 (USNM).

Phaenicia (Viridinsula) setosa James, new species.

Male. *Head* elongated, black in ground color, at most reddish brown immediately below the eye and on oral margin, overlaid with dense whitish pollen which all but obscures the ground color, the pollen somewhat less dense on the occiput except for the orbits; frontal stripe brownish black, becoming reddish brown at lunule. Frontal stripe parallel-sided, about half width of frons; frons 0.16 to 0.17 head width. Reclinate frontoorbitals, ocellars and inner verticals strong and long; outer verticals 1.5 to 2 times as long as occipital fringe but weak; five or six strong frontals and several weaker ones; a row of fine setulae on each parafrontal; parafacials bare. Setae of head black except on posterior part of gena and lower part of occiput. Antennae black, apical part of second segment reddish; setulae of first and second segments black; arista black at base, otherwise yellowish red; rays above all long except at base. Proboscis long and slender; haustellum approximately parallel-sided, measured to apex of sclerotized portion about 4.5 as long as wide, shining black; labella small. Head measurements in micrometer units (60 = 1 mm.): head width, 135; width of frons, 22, of frontal stripe, 10; width of vertex, 28; eye height, 85; head height, 122;

distance between vibrissae, 30; vibrissa to oral margin, 6; vibrissa to nearest part of eye, 40; minimum width of parafacial, 16.

Thorax bright green dorsally, with bluish reflections, particularly on anterior part of postsutural area medially, on a presutural spot outside each dorsocentral row, and laterally; thorax mostly covered with dense whitish pollen. Propleura with fine yellow pile. Setulae and bristles of thorax black; setulae semierect; acrostichals 2:2; dorsocentrals 3:3; intraalars 3:2, the anterior postsutural lacking, the hind presutural strong; posthumeral present and strong, an additional strong bristle between the posthumeral and the middle preintraalar occurring irregularly on one side of the mesonotum in the holotype; three humerals, sometimes a weak fourth; one or more accessory stigmatals and propleurals; a group of bristle-like erect setulae in position of and replacing the pteropleural. Three strong marginals, 1 strong apical, and 2 moderately strong discoscutellars. Legs black, hind ones sometimes pitchy. Wings hyaline; basal sclerites black; basal part of costa yellow, other veins at base brownish, veins becoming brownish black beyond bases; R_{4+5} setulose more than half way to r-m. Squamae white, sometimes tinged with yellow.

Abdomen metallic green; first tergum black except for large triangular pollinose patches laterally on ventral surface; broad apices of apparent second and third terga and a narrow median vitta on each, black; green areas heavily dusted with somewhat tesselated whitish pollen, but the metallic sheen showing through; setulae of abdomen long and mostly semierect, some setulae becoming indistinguishable from bristles; second tergum with a well-defined median marginal pair and sometimes accessory bristles; third with a strong marginal row and one or more discals or strong setae that resemble discals; fourth tergum well set with discals in about three rows, indistinguishable in form from the marginals.

Genitalia as in figures 7 and 8. First hypopygial tergum black, shining; second black, dulled with pollen; inner forceps brownish, slender, acute from dorsal view; outer forceps yellowish brown, broadly rounded apically. Hairs of genitalic terga and of claspers long, abundant, black.

Length, 5–7.5 mm., of holotype 6 mm.

FEMALE. Frontal stripe usually wholly black in well colored specimens, sometimes partly brownish black; vertex about one-third head width, frons widening gradually to 0.42 head width at antennal bases; frontal stripe broadest at ocellar triangle, narrowing to lunule. Measurements of allotype in micrometer units: head width, 158; vertex, width, 54; width of frons at anterior ocellus, 52, at antennal bases, 70; frontal stripe at anterior ocellus, 32, at antennal bases, 25. Outer verticals almost as long and strong as inner verticals; 2 strong proclinate frontoorbitals, subequal in length and strength or the anterior one the stronger. Abdomen more robust than in male; last tergite (of "ovipositor") black, shining,

with erect black setulae and 2 pairs of slender bristles; first tergum of "ovipositor" brownish black, subshining but dull apically, with a marginal row of bristles. Otherwise, except sexually, as described for the male.

Length, 5–8.5 mm.

TYPES. *Holotype*, male, Darwin Island, January 29, 1964, D. Q. Cavagnaro; California Academy of Sciences type no. 9080. *Allotype*, female, same data. *Paratypes*, 32 males, 22 females, same data; 1 male, 1 female, Wolf Island, January–February, 1964, D. Q. Cavagnaro; 2 males, Culpepper (Darwin) Island, December 10, 1899 (USNM).

The United States National Museum paratypes were examined by Townsend and bear his identification label "Dyscritomyia fasciata Gr. vel sp. aff." The median dorsal bristles of the third tergum suggest *Dyscritomyia*, but they are not strongly differentiated, as in that genus; rather they grade into the erect setae of varying strength on that segment. This is even more the case on the fourth tergum where bristles, merging into setae laterally and ventrally, are set over the entire dorsal area. In this respect the resemblance is closer to *Francilia* than to *Dyscritomyia*. Unlike both *Francilia* and *Dyscritomyia*, and like other groups of *Phaenicia*, the hindmost preintraalar is present and strong.

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